REG.NO.:

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF ELECTRONICS ENGINEERING
CONTINUOUS ASSESSMENT TEST - 2
WINTER SEMESTER 2025-2026

SLOT: C2+TC2

Programme Name & Branch : B.TECH CSE
Course Code and Course Name : BECE204L- MICROPROCESSORS & MICRCONTROLLERS
Faculty Name(s) : DR. NAUSHAD MANZOOR LASKAR (COURSE COORDINATOR)
Class Number(s) :VL2025260501053/1014/1018/1022/1055/1024/1020/1035/1057/1039/1028/1059/1043/1030/1046/1061/1064/1033/1068/1070/1072/1066/1074/1076/1049/1078

Date of Examination :
Exam Duration : 90 minutes **Maximum Marks: 50**

General instruction(s):

Q. No	Question	M	CO	BL

1.	In a portable patient heart rate monitor using AT89C51 microcontroller, design and justify an 8051 Assembly Language Program (ALP) using Timer 0 in Mode 1 to create a precise 50 ms delay function (D). Apply this delay to generate a 50% duty cycle square wave of frequency F = 1/(4D) on pin P1.0 driving an IR LED for PPG sensor.
	
	Justify all timer calculations for 12 MHz crystal frequency.
	
	Answer: ……
	
	D= 50ms, THTL= 50000 = 3CB0H
	
	F= 1/4D, Time period, T = 4D
	
	For 50% duty cycle, $T_{on} = T_{off} = 2D = 100ms$
	
	……
	
	`ORG 0000H`
	`MOV TMOD,#01H ; Timer0 Mode1 (16-bit)`
	`MAIN:`
	`SETB P1.0 ; LED ON`
	`ACALL DELAY`
	`ACALL DELAY ; 100 ms ON`
	`CLR P1.0 ; LED OFF`
	`ACALL DELAY`
	`ACALL DELAY ; 100 ms OFF`
	`SJMP MAIN ; Repeat forever`
	
	`;------------ 50 ms Delay Function D ------------`
	
	`DELAY:`
	`MOV TH0,#3CH`
	`MOV TL0,#0B0H`
	`SETB TR0 ; Start Timer0`
	`WAIT:JNB TF0,WAIT ; Wait for overflow`
	`CLR TR0`
	`CLR TF0`
	`RET`
	`END`
		10	4	

2.	In a real-time embedded system, two switches are connected to the MSB and LSB of Port 1 of an 8051 microcontroller. Analyze the input combinations and develop an Assembly Language Program (ALP) that continuously monitors these pins and performs the required operations as follows:
	• When MSB = 0 and LSB = 1, write a program for counter 1 in mode 2 to count the pulses fed into pin T1.
	• When MSB = 1 and LSB = 0, continuously receive the character "MPMC" at a baud rate of 4800.
	Assume XTAL = 11.0592 MHz, 8-bit data, and 1 stop bit.
	Answer:
	`ORG 0000H`
	`MOV TMOD, #62H ; Counter 1 and Timer0 Mode2 (auto-reload)`
	`MOV SCON, #50H ; Mode1, REN=1, TI=1 initially`
	`Monitor:JNB P1.7,Counter ;`
	`JB P1.0,Monitor ;`
	`//.....RECEIVE_Mode: P1.7=1, P1.0=0.....///`
	`MOV TH0,#FAH (or -6 for 4800 BR)`
	`SETB TR0`
	`HERE: JNB RI,HERE`
	`MOV A, SBUF`
	`CLR RI`
	`SJMP Monitor`
	`//.....Counter.....//`
	`Counter:JNB P1.0,Monitor ; P1.7=0, P1.0=1`
	`MOV TH1,#00 ;clear TH1`
	`SETB P3.5 ;make T1 input`
	`SETB TR1 ;start the counter`
	`BACK: MOV A,TL1 ;get copy of count TL1`
	`MOV P2,A ;display it on port 2`
	`JNB TF1,BACK ;keep doing it if TF=0`
	`CLR TR1 ;stop the counter 1`
	`CLR TF1 ;make TF=0`
	`SJMP Monitor ;keep checking and doing it`
		10	4	

3.	Design and write an 8051 Assembly Language Program (ALP) to perform multiple tasks simultaneously using interrupts. The program should continuously read data from P1.0 and send it to P1.7. Whenever data is received through the serial port, the microcontroller should sent the received data to Port P0. In addition, use Timer 0 interrupt to generate a 10 kHz square waveform on P0.1. The serial communication interrupt must be configured with higher priority than the Timer 0 interrupt to ensure that incoming serial data is serviced immediately. Assume a crystal frequency of 11.0592 MHz, configure the serial communication with a baud rate of 19200 and ensuring that the program does not directly access the TL0 or TL1 registers during program execution.
	F=10KHz, T=100microsec, TH0=-92 = A4H
	For BR = 19200, SMOD = 1 and TH1 = -3 = FDH
	Answer:
	`ORG 0000H`
	`LJMP MAIN`
	`//.....Timer 0 ISR.....//`
	`ORG 000BH`
	`CPL P0.1`
	`RETI`
		10	4	

```
//……..SERIAL COMM ISR……..//
ORG 0023H
LJMP SERIAL
//……MAIN PROGRAM……..//
ORG 0030H
MOV TMOD, 22H
MOV IE, #92H
MOV IP, #10H (OR SETB IP.4); FOR SERIAL COMM PRIORITY
MOV TH0, # A4H ; or -92 for  100 micro sec
MOV PCON, #80H    ; Set SMOD=1 for double BR
MOV TH1, #FD       ; or -3  for 19200 BR
SETB P1.0       ; MAKE INPUT
SETB TR0
SETB TR1
AGAIN: MOV C, P1.0
       MOV P1.7, C
       SJMP AGAIN

//……..SERIAL SUBROUTINE……..//
          ORG   100H
SERIAL:   JB    TI,TRANS          ;jump if TI is high
          MOV   A,SBUF            ;otherwise due to received
          MOV   P0,A        ;send serial data to P0
          CLR   RI          ;clear RI since CPU does not
          RETI              ;return from ISR
TRANS:    CLR   TI          ;clear TI since CPU does not
          RETI              ;return from ISR
          END
```

4. Design and analyze an 8051 Assembly Language Program (ALP) for a smart classroom real-time display system at SCOPE, VIT Vellore. Port 1 is connected to a common anode 7-segment display that must continuously show the characters "SCOPE2026" during lab sessions. Use Timer 1 in Mode 1 to generate an accurate 0.5 second delay between successive character displays. The sequence should repeat continuously in real time. Assume a 12 MHz crystal frequency.

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Answer: CAM: Common anode mode, **CCM**: Common Cathode mode

	S	C	O	P	E	2	0	2	6
CAM	92H	C6H	C0H	8CH	86H	A4H	C0H	A4H	82H
CCM	6DH	39H	3FH	73H	79H	5BH	3FH	5BH	7DH

```
ORG 0000H
START: MOV R0, #7
MOV DPTR, #200H
L1: CLR A
     MOVC A, @A+DPTR
       MOV P2, A
       ACALL DELAY
       INC DPTR
       DJNZ R0,L1
   SJMP START

ORG 200H: DB 92H,C6H,C0H,8CH,86H,A4H,C0H,A4H,82H
```

Alternate solution

```
ORG 0000H
START: MOV R0, #7
MOV DPTR, #200H
L1: CLR A
       MOVC A, @A+DPTR
       CPL A
       MOV P2, A
       ACALL DELAY
       INC DPTR
       DJNZ R0,L1
  SJMP START
ORG 200H: DB 6DH,39H,3FH,73H,79H,5BH,3FH,5BH,7DH
```

```
//50MS GENARATED IN Q.1 X 10 = 500MS = 0.5 SEC…..XTAL=12MHZ/
DELAY:
MOV TMOD,#10H        ; Timer1 Mode1 (16-bit)
MOV R1, #10
L1: MOV TH1,#3CH
    MOV TL1,#0B0H        ; 50ms delay
    SETB TR1             ; Start Timer0
WAIT:JNB TF1,WAIT         ; Wait for overflow
    CLR TR1
    CLR TF1
    DJNZ R1, L1
    RET
 END
```

5. In a real-time hospital patient queue monitoring system using an 8051 microcontroller, a 16×2 LCD display is interfaced such that Port 1 is connected to the LCD data lines and Port 2 is connected to the LCD control lines. Design an 8051 Assembly Language Program (ALP) to display only first five odd numbers sequentially starting from the 1st row, 8th position of the LCD for nurse verification. Each number should be displayed with a fraction of delay between consecutive updates.
Assume XTAL = 22 MHz, digits 0 to 9 are stored in program memory starting at ROM address 200H.

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Answer:

```
ORG 0000H
MOV A,#38H
ACALL COMNWRT
ACALL DELAY
MOV A,#0EH
ACALL COMNWRT
ACALL DELAY
MOV A,#01H
ACALL COMNWRT
ACALL DELAY
MOV A,#06H
ACALL COMNWRT
ACALL DELAY
MOV A,#88H
ACALL COMNWRT
ACALL DELAY
START: MOV R0, #5
MOV DPTR, #200H
L1:    CLR A
       INC DPTR
       MOVC A, @A+DPTR
       ACALL DATAWRT
       ACALL DELAY
       INC DPTR
       DJNZ R0, L1
       SJMP START

COMNWRT:  MOV P1,A
CLR P2.0
CLR P2.1
SETB P2.2
ACALL DELAY
CLR P2.2
RET

DATAWRT: MOV P1,A
SETB P2.0
CLR P2.1
SETB P2.2
ACALL DELAY
CLR P2.2
RET

DELAY: MOV R3,#255
HERE: DJNZ R3,HERE
RET


ORG 200H: DB "0123456789"
          END
```

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